sending actual position feedback data to the servocontroller for comparison with an error limit variable;

calculating the torque to be applied based upon the error found in comparing the theoretical position and the actual position; and

A3 generating an output signal to the servocontroller based on the position error for torquing the caps such that a predetermined torque is attained.

21 19. The method of Claim 18 wherein the step of sending is carried out by an incremental position monitoring device such as an encoder.

REMARKS

This application has been reconsidered in light of the recent Office Action dated November 20, 2002, and the references cited therein. Applicant hereby requests further examination and reconsideration of the present application in view of the foregoing Amendments.

For convenience of review the following paragraph numbers correspond to those claim rejections set forth in the Office Action dated November 20, 2002, as follows:

Allowable Subject Matter

15. Claims 10, 11 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and intervening claims.

In summary, Claim 13 and intervening Claim 12 have been cancelled and the structural limitations thereof combined in Claim 1(Amended) to distinguish over the cited references. Claims 10 and 11 are retained as originally submitted and now depend from Claim 1 (Amended). Claim 16 (Amended) has also been amended to include the structural limitations of Claim 13 and the intervening Claim 12. Claim 17 has been cancelled. New Claims 18 and 19 to a method of the present invention have been added, which find support in the specification as originally submitted.

Information Disclosure Statement

The Examiner's comments indicating the Information Disclosure Statement filed 06/13/2001 fails to comply with 37 CFR 1.98(a) (1)-(2) is gratefully acknowledged.

Claim Rejections - 35 USC § 112

7. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
8. Claim 2 recites the limitation "POS-THEORT(t)" in line 5f claim 2. There is insufficient antecedent basis for this limitation in the claim.

With respect to claim 2, the limitations POS_THEORET(t), POS_REAL(t), S(t), and E_LIMIT are indefinite because it is unclear what scope these variables cover. Claim 2 also recites two variables POS_THEORET(t) and POS_THEORT(t) and it is uncertain if these variables are meant to mean the same position.

Accordingly, applicant has amended Claim 2 to more particularly point out and distinctly claim the subject matter which applicant regards as the invention. More particularly, applicant has corrected a typographical error initially shown in the variable POS_THEORET(t).

Thus, it is believed that the scope of the variables in Claim 2 (Amended) has been clarified and that Claim 2 (Amended) is now in condition for allowance. Reconsideration and withdrawal of the rejection under 35 USC § 112, second paragraph, is requested.

Claim Rejections - 35 USC § 102

9. Claim 16 is rejected under 35 U.S.C. 102(e) as being anticipated by Grove et al. (6,105,543).

With respect to claim 16, Grove et al. anticipates the improvement to a capping machine comprising a central processing unit for setting parameters that govern application of torque transmitted by said cap driver, and a servocontroller interfaced for bi-directional, communication with said central processing units, said servocontroller generating an output signal to said driving means based on the position of said cap driver for torquing said caps such that said predetermined torque is attained as described in column 5, lines 36-57 and as seen in Figure 1.

Anticipation Standard

The Patent Office is respectfully reminded that the standard for lack of novelty, that is for "anticipation" under 35 U.S.C. § 102(b) is one of strict identity. There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. Scripps Clinic and Research Foundation v. Genentech, Inc., 18 U.S.P.Q. 2d 1001, 1010 (Fed. Cir. 1991).

Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim. Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Company, 221 U.S.P.Q. 481, 485 (Fed. Cir. 1984).

It is respectfully submitted that the Patent Office has not made a proper prima facie showing of anticipation in this case for the following reasons:

Grove Does Not Disclose a Closed-Loop Control System

Grove et al. does not provide a closed-loop control system for continuously controlling torque in the manner of the present invention. In Grove et al. the spindle drive motor 24 is used for controlling the rotational velocity (i.e. speed only) of the driver rotating the capping chuck while screwing the cap on the threaded neck of the bottle (column 4, lines 1-5). Torque is monitored, but not controlled by, strain gage 52. At the time of reaching a predetermined torque, the distance made by the driver (corresponding to the position of the cap) is examined to determine if the cap was cross-threaded and whether the bottle must be rejected. The value of the applied torque is established by slipping clutches and not by the speed of the driver, which results in significant errors affecting the capping torque. Large variations in such error is due to friction fluctuation in clutch disks due to changes in ambient conditions, especially temperature rising during the slippage, and wearing of slipping surfaces.

In the present invention the driver's theoretical velocity trajectory as a function of time is generated by the computer at the start of each capping cycle. The trajectory function is applied to the servocontroller and is integrated over the time resulting in a theoretical angular distance of the driver. The actual driver distance is monitored by an encoder during the cycle time. Error is calculated as the difference between real distance and theoretical distance. Error is proportional to the applied torque at all times during the capping cycle. Thus, in the present invention there is a closed loop system for controlling torque.

In order to expedite prosecution of this application, Claim 16 (Amended) has been amended to include the structural limitations of Claims 12 and 13 deemed to be allowable subject matter by the Examiner as set forth in the Office Action to obviate the rejection

under 35 USC 102(e). Reconsideration and withdrawal of the anticipation rejection is respectfully requested.

Claim Rejections - 35USC § 103

12. Claims 1, 2, 5-9, 12, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grove et al. (6,105,343) in view of Stover (2,891,366 and further view of Ruhl et al. (5,301,488).

13. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grove et al. (6,105,343 in view of Stover (2,891,366) and further in view of Ruhl et al. (5,301,488)in further view of Sonnenburg (2,349,524).

Claims 1, 2, 3, 4, 5-9, 12, 14, 15 and 17 stand rejected under 35 U.S.C. 103(a) based on Grove et al. (6,105,343) in combination with the secondary references recited in the Office Action dated November 20, 2002. It is reiterated that Claim 13 and intervening Claim 12 indicated as allowable by the Examiner have been cancelled and the structural limitations thereof combined in Claim 1(Amended) to distinguish over the cited references.

Thus, it is respectfully submitted that Claim 1 (Amended) and Claims 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, and 15 depending directly and/or indirectly therefrom are now in full condition for allowance. Claim 16 (Amended) is also allowable for the reasons set forth hereinabove.

Accordingly, Applicant respectfully submits that the Application is now in full condition for allowance. Reconsideration and withdrawal of the rejections is requested.

Further, as required by amended Rule 1.121, a marked up version of the changes made to the claims by the current amendment is attached hereto. The attached page is captioned, "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

If any outstanding questions remain, a telephone call from the Examiner would be welcome.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	Patent Application of Tadeusz Kemnitz
Title:	Rotary Capping Apparatus and Feedback Control System for Regulating Applied Torque
Serial No.:	09/879,623
Filing Date:	06/13/2001
Art Unit:	3721
Examiner:	Tran, Louis B.
Atty. Docket No.:	P-9913a

Commissioner for Patents and Trademarks
Washington, DC 20231

Honorable Sir:

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the accompanying Amendment to the Office Action dated November 20, 2002, the following changes have been made:

IN THE CLAIMS

The claims have been amended as follows:

1. (Amended) A rotary capping apparatus for applying screw-on type caps to containers, said apparatus comprising:

a primary supporting frame having a plurality of vertical leg members;

[a capping head disposed in vertically adjustable relation to said primary supporting frame;]

a cap driver assembly including an inflatable gripping means for application of a predetermined torque to [said]the screw-on type caps, said cap driver assembly being mechanically coupled to said capping head;

primary height adjusting means for imparting vertical movement to said capping head;

a driving means including a servomotor for transmitting a predetermined torque to said cap driver assembly, said driving means being mounted on said height adjusting means and mechanically coupled to said capping head;

container indexing means mechanically attached to said driving means for synchronous advancement of said containers to said cap driver assembly for torquing;

a capping head disposed in vertically adjustable relation to said primary supporting frame, wherein said capping head includes a housing containing a gear mechanism and at least one input shaft having a hollow core for transmission of torque from said driving means to said cap driver assembly, said core being disposed in fluid communication with an inflatable gripping means permitting the flow of compressed air and vacuum thereto, wherein said at least one input shaft is mechanically connected to said driving means by an axially extensible spline mechanism that permits simultaneous rotation and vertical extension of said at least one shaft during operation of said driving means; and

closed loop controlling means for applying said predetermined torque further including:

(a) a central processing unit for conducting proportional, integral, and derivative control calculations,

(c) an operator console for setting parameters that govern application of said torque transmitted by said cap driver assembly to said caps, and

(b) a servocontroller interfaced for bidirectional communication with said central processing unit, said servocontroller generating an output signal to said servomotor based on the position of said cap driver assembly for torquing said caps such that said predetermined torque is attained.

2. (Amended) The rotary capping apparatus of Claim 1 wherein said servocontroller is capable of generating a theoretical position profile represented by POS_THEORET(t) and wherein said servocontroller receives position feedback represented by POS_REAL(t) obtained from an incremental position monitoring device, said POS_REAL(t) being compared to said POS_THEORET(t) and any discrepancy therebetween generating a proportional, integral, and derivative output control signal represented by S(t) and wherein the mathematical relation is expressed as S(t) =

POS_[THEORT] THEORET(t) - POS_REAL (t), wherein (t) is a time base, said servocontroller being programmed to automatically set S(t)=0 whenever POS_THEORET(t) - POS_REAL(t) exceeds E_LIMIT wherein E_LIMIT is a programmable parameter governing said predetermined torque.

16. (Amended) An improved rotary capping apparatus for applying screw-on caps to containers, said apparatus including a supporting frame, [a capping head disposed in vertically adjustable relation to said frame,] a cap driver for application of torque to said caps, driving means for transmitting a predetermined torque to said cap driver, and container indexing means for delivery of said containers to said cap driver, said improvements comprising:

a capping head disposed in vertically adjustable relation to said primary supporting frame, wherein said capping head includes a housing containing a gear mechanism and at least one input shaft having a hollow core for transmission of torque from said driving means to said cap driver, said core being disposed in fluid communication with an inflatable gripping means permitting the flow of compressed air and vacuum thereto, wherein said at least one input shaft is mechanically connected to the driving means by an axially extensible spline mechanism that permits simultaneous rotation and vertical extension of said at least one shaft during operation of said driving means; and

closed loop controlling means for calculation of said predetermined torque further including:

(a) a central processing unit for setting parameters that govern application of said torque transmitted by said cap driver, and

(b) a servocontroller interfaced for bidirectional communication with said central processing unit, said servocontroller generating an output signal to said driving means based on the position of said cap driver for torquing said caps such that said predetermined torque is attained.

The following new claims have been added:

18. A method of controlling applied torque in a rotary capping apparatus having a

cap driver assembly for torquing screw-on caps to containers and a closed-loop control system including a servocontroller interfaced for bidirectional communication with a central processing unit, said method comprising the steps of:

producing a theoretical position profile for the cap driver assembly with the servocontroller at the start of each capping cycle;

sending actual position feedback data to the servocontroller for comparison with an error limit variable;

calculating the torque to be applied based upon the error found in comparing the theoretical position and the actual position; and

generating an output signal to the servocontroller based on the position error for torquing the caps such that a predetermined torque is attained.

19. The method of Claim 18 wherein the step of sending is carried out by an incremental position monitoring device such as an encoder.